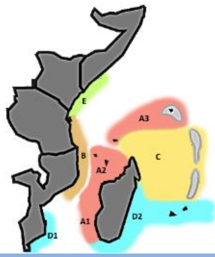
WESTERN INDIAN OCEAN – Regional coral bleaching alert



DATE OF THIS ALERT: 16 March2020

http://www.cordioea.net/bleachingalert/

Contact: bleaching@cordioea.net

Bleaching Alert Level

- ***'warning'*** *– indications of warmer conditions that may result in some bleaching*
- ***'level 1' – moderate bleaching possible***
- ***'level 2' – severe bleaching likely***

Forecasted bleaching is for the entire season (Jan-May), to facilitate preparation and early responses

16 March 2020 – Coral bleaching forecast – Western Indian Ocean

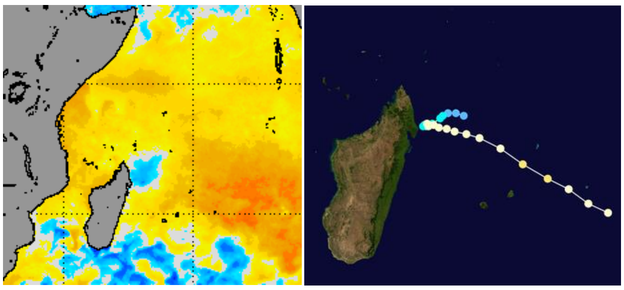
Area	Region	Alert	Bleaching observations
S Moz/S Africa	*Cool, south (D1)*	*none*	*Bleaching risk likely ended*
SWIO/E Madag	*Cool, south (D2)*	*moderate*	*Bleaching risk likely ended*
SW Madagascar	*Hot, south (A1)*	*severe*	*Low bleaching, Velondriake LMMA*
South Equat Curr	*Moderate, central (C)*	*moderate*	
East Moz Cha/Comoros	*Hot, central (A2)*	*severe*	*Early bleaching, Mayotte*
NW Moz Cha /Tanz	*Warm, central (B)*	*severe*	*Low bleaching (Zanzibar)*
NW Seychelles	*Hot, north (A3)*	*severe*	
Kenya-Somalia	*Variable, north (E)*	*severe*	*Low bleaching (Kenya)*

Global & Regional Indicators

No changes since February and both ENSO and IOD are still in neutral phases. Sea surface temperatures remain warmer than average across much of the Indian Ocean basin. The Bleaching Outlook (March-June) remains significant throughout the equatorial belt.

NOAA Products – 2nd March 2020

SST anomaly



Left: Sea surface temperatures continue to increase across the whole of the WIO, except for a cold 'hole' at the NE tip of Madagascar created by cyclone Herold. Cyclone Herold formed near Madagascar on 12 March, then moved SE, passing north of Mauritius, and is still active.

With the passage of Herold, it is likely that bleaching risk in the SWIO/E Madagascar region has ended.

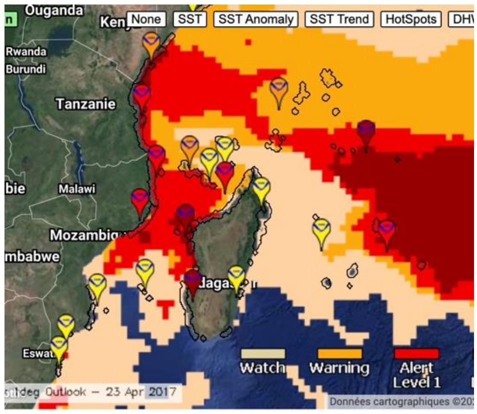
REPORT ALL BLEACHING (AND NON-BLEACHING) OBSERVATIONS HERE

https://goo.gl/forms/jP3Ke9cclt3VM9403

Recent bleaching observations - 2020

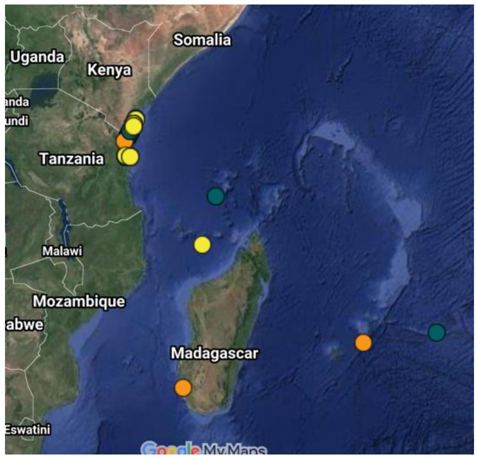
- Shimoni, Kenya, 13-15 Mar 2020. **Low bleaching (1-10%)** (Ewout Knoester, REEFolution)
- Watamu, Kenya, 7-11 Mar 2020. **Low bleaching (1-10%)** (Dadley Tsiganyiu, KWS; Gabriel Grimsditch, UNEP)
- Jambiani, Zanzibar, 20-28 Feb 2020. **Low bleaching (1-10%)** (Christian Vaterlaus, Marine Cultures)
- Kizimkazi, Zanzibar, 19 Feb 2020. **Low bleaching (1-10%)** (Lara Jackson, African Impact)
- Kilifi, Kenya, 17-18 Feb 2020. **Low bleaching (1-10%)** (Julian Sitemba, Ali Swaleh Aboud, CORDIO)
- Diani, Kenya, 14 Feb 2020. **No bleaching (<1%)** (Jenni Choma, Marine Education Ctr)
- Mayotte -13.03S,45.21E, 1st Feb 2020. **Bleaching** (Gaby Barathieu)

Virtual stations and 4-week outlook



All virtual stations are showing high levels of alert, and the shading shows the outlook for bleaching in the next 4 weeks, to 15 April – high along the entire East African reef, Comoros and W Madagascar.

[Bleaching observations, as of 16 March 2020](#)



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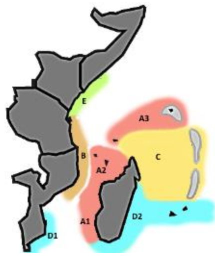

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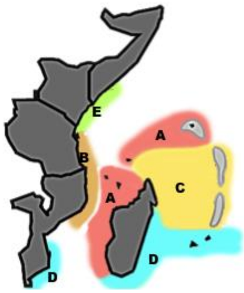
Explanations

WIO climatology regions



Since 2014, bleaching reporting regions are used as defined by SST analysis from the last decade (2003-2009 as 'background' years, and 2010 as a year of high bleaching), rather than a longer historical record that includes pre-1998 SSTs. Five SST zones were identified:

A – the hottest region; the East Mozambique Channel and Comoros (reported as A1, SW Madagascar; A2, NE Madagascar Channel; and A3, NW Seychelles islands).

B – the second hottest region; East African mainland coast from 7-18ºS (Zanzibar/Dar es Salaam to Primeiras/Segundas islands), and including the Northwest Mozambique Channel

C – a moderate/intermediate region; the South Equatorial Current region, comprising the Mascarene Banks, southern Seychelles islands and NE Madagascar

D – the southern cooler regions; SW Indian Ocean islands, E and S Madagascar and S Mozambique and South Africa. Split into 2 sub-regions.

E – the cooler northern but highly variable region; the Kenya-Somali coast, including Pemba island and N Tanzania coast (Tanga).

Because of latitudinal variation (e.g. in A) and geographic splitting (e.g. A and D), we report in 8 sub-regions.

Alert levels

Statistical analysis of alerts from 2007-13 indicated that low confidence is attached to an alert of 'low' bleaching risk (i.e. not zero risk, but not severe). By contrast, predictions of 'mid' and 'high' risk of bleaching were more reliable. Accordingly, the alert is being presented as:

- ***'warning'** – indications of warmer conditions that may result in some bleaching*
- ***'level 1' – moderate bleaching possible***
- ***'level 2' – severe bleaching likely***

These findings match the categories used by NOAA, with 'watch', 'bleaching level 1' and bleaching level 2' categories, respectively.

Sea Surface Temperatures (SST)

The surface of the sea heats up by direct insolation, causing stress to corals and other shallow water organisms. Satellites directly measure the skin-temperature of the sea, providing these maps and coral bleaching products for early warning.

Predicted Bleaching

The Bleaching Thermal Stress Outlook is based on sea surface temperature (SST) forecasts generated by the Linear Inverse Model from the NOAA Earth System Research Laboratory. In a normal year, the Outlook forecasts no potential for bleaching. The baseline years for calculations (i.e. the climatology) are 1985-93, excluding 1991 and 1992 due to high atmosphere volcanic dust from Mt. Pinatubo.

Wind-driven mixing

Wind is an important physical factor influencing conditions conducive to coral bleaching. Wind-driven mixing reduces temperature stress and wind generated waves can scatter harmful levels of incoming solar radiation.

- *Cyclones - cause strong mixing, reducing SST.*
- *Doldrums - periods of sustained low wind promote stratification, and heating of the upper layers of water. They therefore promote environmental conditions adverse to corals experiencing thermal and/or light stress.*

El Niño/Southern Oscillation (ENSO)

The El Niño/Southern Oscillation (ENSO) is the most important coupled ocean-atmosphere phenomenon to cause global climate variability on interannual time scales.

***Multivariate ENSO Index (MEI)** - Negative values of the MEI represent the cold ENSO phase (La Niña), while positive MEI values represent the warm ENSO phase (El Niño).*

***The Southern Oscillation Index (SOI)** is calculated from the monthly or seasonal fluctuations in the air pressure difference between Tahiti and Darwin (Note, negative SOI is equivalent to positive MEI).*

***The Nino 3.4 index** is similar to the SOI, but focused on the central Pacific Niño region, straddling the equator and from 170-120ºW. It has been found to be most strongly associated with climatic consequences in the African region, so is used here.*

Indian Ocean Dipole

The Indian Ocean Dipole is analogous to the ENSO, but for the Indian Ocean. It is calculated using the Dipole Mode Index (DMI), which calculates the gradient between the western equatorial Indian Ocean (50E-70E and 10S-10N) and the south eastern equatorial Indian Ocean (90E-110E and 10S-0N).

Global indicators

Local temperatures are affected by global and regional trends. With global warming, temperatures are expected to rise over longer periods (decades), but significant variation can occur between years, and under the influence of regional and multi-year factors such as ocean-atmosphere interactions across the Pacific and Indian Ocean.

Data sources

https://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/long-range/decadal-fc/index
http://coralreefwatch.noaa.gov/
https://en.wikipedia.org/wiki/2019%E2%80%9320_South-West_Indian_Ocean_cyclone_season
http://www.mtotec.com/
http://www.bom.gov.au/climate/enso/#tabs=Indian-Ocean
http://www.ioc-goos-
https://stateoftheocean.osmc.noaa.gov/sur/ind/dmi.php
http://www2.cnrs.fr/en/3148.htm

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